

PURWANCHAL UNIVERSITY

VII SEMESTER FINAL EXAMINATION-2004

LEVEL : B. E. (Civil)

SUBJECT: BEG456CI, Design of RCC Structures.

Full Marks: 80

TIME: 03:00 hrs

Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data. IS456, IS1343 and SP16 are allowed to use.

Attempt any FOUR questions.

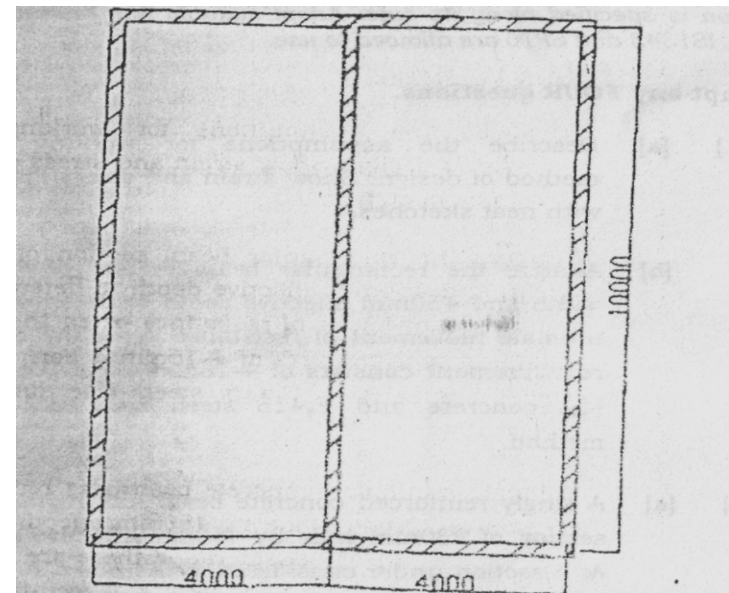
Q. [1] [a] Describe the assumptions for working stress method of design. Show strain and stress diagrams with neat sketches. [10]

[b] Analyze the rectangular beam section of 300mm width and 450mm effective depth to determine the ultimate moment of resistance when the tension reinforcement consists of 4 -16mm ϕ bar. Consider M₂₀ concrete and Fe415 steel. Use limit state method. [10]

Q. [2] [a] A singly reinforced concrete beam has rectangular section of 230mm wide by 450mm effective depth. At a section under consideration there are 2-12mm dia bentup bars at 45°, and 2 legged-6mm dia stirrups@100mm c/c. The grade of concrete is M₂₀ and the reinforcement is Fe415. Percentage of steel is 0.43. Determine the shear force to be permitted at the section. [10]

[b] Design a square column to carry load of 1000kN(unfactored). Kept the side of square column as 350mm and the effective length is 3m. Design the tie and draw the cross section details. Use M₂₅ concrete and Fe415 steel. [10]

[3] [a] Design a slab shown in Fig. 3[a]. It is subjected to live load of 4 kN/m² and surface finish of 1 kN/m². Use co-efficient given in code for analysis of slab. Adopt M₂₀ mix concrete and Fe415 grade steel. [14]



All dimensions are in mm.

All spans are effective spans.

Walls are 230mm thick.

Fig. 3[a]

Contd. ...

[b] Sketch the reinforcement details for the above slab using simplified rules of curtailment. [6]

Q [4] [a] Write down the design steps with appropriate formula and sketches for a solid rectangular footing subjected to axial load 'p' and uniaxial movement 'M'. [10]

[b] A simply supported pre-stressed concrete beam of cross section 400mmx600mm is loaded with UDL of 256 kN (total load) over a span of 6m. Sketch the distribution of stresses at mid-span and end section if the pre-stressing force is 1920 kN, and the tendon is concentric. [10]

Q [7] Write short notes on (any TWO): [2x10=20]

[a] Losses of Pre-stress

[b] Reinforcement Splicing

[c] Serviceability Limit State

PURWANCHAL UNIVERSITY

VII SEMESTER FINAL EXAMINATION-2005

LEVEL : B. E. (Civil)

SUBJECT: BEG456CI, Design of RCC Structures.

Full Marks: 80

TIME: 03:00 hrs

Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data. IS456, IS1343 and SP16 are allowed to use.

Attempt any FOUR questions.

Q. [1] [a] What are the different limit states of design? What are the merits of limit states design Philosophy over other design philosophy? [10]

[b] A rectangular beam 250mm by 500mm deep is reinforced with 2-16mm bars in compression zone and 4-25 mm bars in tension zone, each at an effective cover of 40 mm. Determine the force of compression, force of tension, cracking moment and moment of resistance. Assume M 20 concrete and Fe415 grade steel. Use limit state method. [10]

Q. [2] [a] A simply supported beam is 230 mm by 450 mm deep and has 2-20 mm TOR bars going into the support. If the shear force at the center of support is 100 KN at working load. Determine the anchorage length. Assuming 25 mm clear cover to the longitudinal bars. Use M 20 concrete mix and Fe415 grade TOR steel. Load factor=1.5. [10]

[b] A column 450 mm * 450 mm in section and reinforced with 20 cm² longitudinal reinforcement is 2 m high. It is fixed at the bottom and is-free at the top. Determine the safe axial load on the column. Use M 20 concrete and Fe 415 grade for steel. [10]

Q. [3] [a] Design a two way slab for a room 5.5 m * 4 m in effective size if the superimposed load is 5 KN/m² and floor finish of 1KN/ m². Use co-efficient given in code for analysis of slab. Adopt M 20 mix concrete and Fe415 grade steel. Design for edges simply supported-corners not held down. [1+4]

[b] Sketch the reinforcement detail for the slab mentioned in Q. [3] [a] using simplified rules of curtailment. [6]

Q. [4] [a] Design the foundation footing of an RCC column 40cm * 40cm in cross-section carrying an axial load of 1200 KN. The bearing capacity of soil is 110 KN/m².

Use $\sigma_{ck} = 15 \text{ N/mm}^2$, $\sigma_k = 415 \text{ N/mm}^2$.

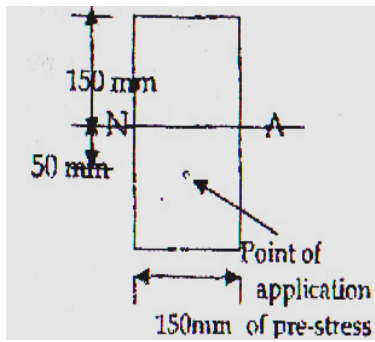
loadfactor=1.5 [12]

[b] A beam of 150 mm * 300 mm is pre-stressed by a force of 300 KN by steel cables located at an eccentricity of 50 mm as shown in figure. Determine loss of pre-stress due to creep of concrete for the following data. [8]

$\sigma_{ck} = 45 \text{ N/mm}^2$, Cables= 6Nos-7 mm

Creep coefficient $\theta=2$, $E_s=200 \text{ KN/mm}^2$;

$E_c = 30190 \text{ N/mm}^2$



Q. [5] Write short notes on [Any FOUR]: [4x5=20]

- [a] Normal distribution curve
- [b] Effective span of stairs
- [c] Shrinkage of concrete
- [d] Spacing of reinforcement
- [e] Combined footing
- [f] Flanged beam

PURWANCHAL UNIVERSITY

VII SEMESTER BACK-PAPER EXAMINATION-2005

LEVEL : B. E. (Civil)

SUBJECT: BEG456CI, Design of RCC Structures.

Full Marks: 80

TIME: 03:00 hrs

Pass marks: 32

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All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data. IS456, IS1343 and SP16 are allowed to use.

Attempt any FOUR questions.

Q. [1] [a] Discuss the salient feature of working stress method, ultimate load method and limit state method [10]

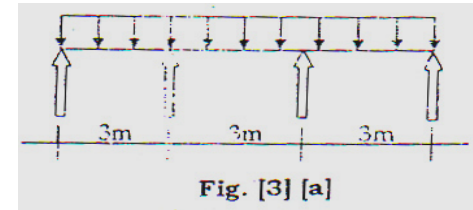
[b] A simply supported beam of effective span 4 meter is subjected to a uniformly distributed load of The section of beam is 200mm wide and 400mm deep up to the center of tensile reinforcement. Find the tensile reinforcement required for the beam. Assume M20 mix concrete and Fe415 grade steel. [10]

O. [2] [a] A RCC beam has effective depth of 650 mm and width of 300mm. Obtain 5-25mm bars. If (i) $\sigma_{ck} = 20 \text{ N/mm}^2$. Calculate the shear reinforcement needed for a factored shear force of 450 KN. [10]

[b] A 4m high column is effectively held in position at both ends and Strained against rotation at one

end. Its diameter is restricted to 400mm. calculate the reinforcement if it is required to carry a factored axial load of 1500 KN. Use M 20 concrete and Fe415 grade for steel. [10]

Q. [3] [a] Design a continuous one way slab having three equal span of 3 meter each as shown in Fig. [3] [a] with following data. Surface finish = 0.75 KN/m², live load 2.5 KN/m², load factor 1.5 use coefficient given in code for analysis of slab. Adopt M 20 mix concrete and Fe 415 grade steel. [14]



[b] Sketch the reinforcement detail for the slab mentioned in Q. [3] [a] using simplified rules of curtailment. [6]

Q. [4] [a] Design a footing for rectangular column 30cm 45cm carrying an axial service load of 950kN/m². The net bearing capacity of the soil is 110 KN/m² use M20 concrete mix and fy 415 grade steel. [12]

[b] What are the advantage and disadvantage of prestressed concrete? Is there any difference between reinforced concrete and pre-stressed concrete? Explain briefly. [8]

Q. [5] Write short notes on [Any FOUR]: [4*5=20]

[a] Development length

- [b] Flat slab [c] combined footing
- [d] Relaxation of pre-stressing steel
- [e] Partial safety factors
- [f] Mode of failure

PURWANCHAL UNIVERSITY
VII SEMESTER FINAL EXAMINATION-2006

LEVEL : B. E. (Civil)

SUBJECT: BEG456CI, Design of RCC Structures.

Full Marks: 80

TIME: 03:00 hrs

Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data. IS456, IS1343 and SP16 are allowed to use.

Attempt any FOUR questions.

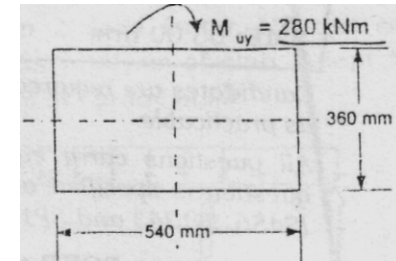
Q. [1] [a] Explain the term 'limiting depth of neutral axis in R.C.C. Beam design. Derive its value for a rectangular section using Fe415 grade steel and M25 concrete. Explain the role of the strength of concrete, if any, on the limiting depth of neutral axis. [10]

[b] A reinforced concrete beam of rectangular section of size 230 x 460 mm overall is to be designed for a factored moment of 200 kNm. Determine the reinforcement required at the effective cover of 40 mm. Use M20 grade concrete and Fe415 grade steel. [10]

Q. [2] [a] A beam with four 25 mm bars as main tension reinforcement has two of its four bars symmetrically bent at the ends of the beam at 45°. Find the stirrups required for resistance against shear failure at the ends if the factored shear force

at the section is 390 kN. Assume the width of beam as 300 mm and effective depth as 500 mm. Assume M20 concrete and Fe415 grade steel. [10]

[b] Design a uniaxially eccentrically loaded rectangular column to support factored axial load of 1200 kN and factored moment as shown in Fig. 2[b]. The unsupported length of the column is 3.4 m. Use M20 grade concrete and Fe415 grade steel. [10]



Q. [3] [a] A room 17.5 x 10 m has brick walls all around and it is to be covered with R.C. Slab supported on the walls and on the central beams in the East-West and North-South directions along the middle of the room. The slab has to carry live load of 4 kN/m². Assume mild exposure conditions and that M20 concrete with Fe415 steel is used for the construction. The slabs are restrained on top of the walls by masonry built above it. Design the slab using IS method. [15]

[b] Show reinforcement details for a rectangular combined footing having two square columns. [5]

Q [4] [a] A stair case with an open well consists of two flight and a span partly crossing at right angles. There

ate ten steps of rise 160 mm and tread 250 mm in each flight and six such steps in the cross span. The width of landings and stairs is 1500 mm. The landings are supported on the walls at the ends. Design a stair slab using M20 concrete and Fe415 steel. [12]

Some part of question are remain!

PURWANCHAL UNIVERSITY
VII SEMESTER EXAMINATION-2007

LEVEL : B. E. (Civil)

SUBJECT: BEG456CI, Design of RCC Structures.

Full Marks: 80

TIME: 03:00 hrs

Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Adopt suitably any missing data. IS456, IS1343 and SP16 are allowed to use.

Attempt any FOUR questions.

Q. [1] [a] What are the different limit states of design? What are the merits of limit states design Philosophy over other design philosophy? [10]

Q. [1] [a] The stress-strain curves for concrete and steel given in IS 456:2000 show that the reduction in the characteristic strength of concrete is applied all along the curve, whereas the reduction for the characteristic strength for steel is applied only from the yield point ($0.87f_y$). Give reasons for this difference, with neat figures. [8]

[b] Design a simply supported rectangular beam for flexure, having effective span 5m, which has to support a point load of 10kN acting at 4m from the left support, in addition to its self weight. A superimposed load of 13kN/m also acts on the beam. Take the width of beam as 230mm. Adopt

M20 grade concrete and Fe415 grade steel for design. [12]

Q. [2] [a] Design a rectangular beam having width 300mm and overall depth 600mm. The factored moment is 320kNm. Adopt M20 grade concrete and Fe415 grade steel. Take the effective cover as 25mm. [10]

[b] Design completely a short column 400mm x 400mm for an axial load of 500kN and the moments of 50kNm and 30kNm about the x-x and y-y axes respectively. Assume suitable cover to M20 grade concrete and Fe415 grade steel. [10]

Q. [3] [a] Design a slab for a room 5.5m x 4m effective in sizes, if the superimposed load and floor finish load are 5kN/m^2 and 1kN/m^2 respectively. Adopt M20 grade concrete and Fe415 steel. Use IS code coefficients to design for flexure and shear, for the slab edges simply supported- corners not held down condition. [14]

[b] Sketch complete reinforcement details for a R.C. rectangular isolated footing assuming suitable data. [6]

Q. [4] [a] A M20 grade concrete rectangular beam of 230mm width and 450mm effective depth has 3-12mm diameter bars at the bottom and 2-12mm diameter bars at top. If the total uniformly distributed load of 30kN/m, is to act on the beam, design for shear, if required. Adopt Fe415 grade steel. For shear you may select suitable grade steel. [10]

[b] A pre-stressed concrete beam 400mmx600mm in section has effective span of 6m and is subjected to a u.d.l. of 16kN/m including the self weight of the beam. The pre-stressing tendons are located at 400mm below the top fiber and provide an effective pre-stressing force of 960kN. Determine the extreme fiber stresses in concrete at the mid-span section. Assume suitable materials. [10]

Q. [5] Write short notes on [Any FOUR]: [4x5=20]

- [a] Principle of pre-stressed concrete analysis.
- [b] Design steps for a dog-legged R.C. staircase.
- [c] Modes of failure of columns with reference to interactive curve
- [d] Flanged beam is not designed for support moments, Justify the statement
- [e] Check for one way shear in one way shear in R.C. isolated footing
- [f] Working stress method and its drawbacks.